

## ABSTRACT OF THE INVENTION

A dynamically controllable photonic crystal comprises at least one micro-cavity, and electrical means to induce carrier refraction in the vicinity of the micro-cavity. In the exemplary case when the photonic crystal is implemented in a semiconductor substrate, localized carrier refraction is achieved using field induced carrier injection or depletion into a carrier concentration column surrounding the micro-cavity. Preferably, if the substrate is silicon, the injection and depletion is achieved using various two or three terminal, unipolar or bipolar structures.